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Research Article

# Isolation and Characterization of Mucilage from *Abroma augusta* and its Application in Pharmaceutical Suspension Preparation

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## Abstract

The purpose of the study is to formulate a new, cheap and effective natural suspending agent that can be used as a potential alternative for traditional suspending agents. This present study was concerned with the extraction of mucilage and its evaluation from *A. augusta*. The various physical, Physico-chemical and phytochemical properties of the mucilage were analyzed using standard procedures. Suspending properties is found to be the most desired properties of a pharmaceutical suspension preparation. Mucilage obtained from the species was assessed by observing particle size, flow rate, viscosity and pH.

**Results:** The mucilage obtained was found to be advantageous to use as a suspending agent in a suspension in a very cost effective manner.

**Conclusion:** The mucilage of *A. augusta* can be used as a potential suspending agent.

**Keywords:** Magnesium carbonate; *Abroma augusta*; Suspension property; Mucilage

## Introduction

In recent years, plant derived polymers have mucilages can occur in high concentrations in different evoked tremendous interest due to their diverse pharmaceutical applications such as diluent, binder, disintegrant in tablets, thickeners in oral liquids, protective colloids in suspensions, gelling agents in gels and bases in suppository [1,2], they are also used in cosmetics, textiles, paints and paper-making industries [3]. Mucilages are heterogenous in composition, slimy masses and are typically polysaccharide complexes formed from the sugars, galactose, arabinose, glucose, mannose, xylose and uronic acid units [4,5]. Mucilages act as energy reserves in the rhizomes, roots and seed endosperms.

*Abroma augusta* L. is an important medicinal plant belongs to the family Malvaceae. It is commonly called as Devils cotton in English and Ulatkambal in Hindi. It is a species having dark red flowers with a hairy leaves and stems which cause irritation to skin when touch. They generally grow from late spring to early summer. It is found in tropical Asia, Africa and Australia. The whole plant is found to contain several alkaloids, flavonoids, terpenoids etc. This plant species is found to be useful in diabetes, jaundice, dermatitis, rheumatic pain, cough, hypertension etc. [6,7] (Figures 1 and 2).

## Experimental Section

### Materials procurement

The experimental material includes the cultivated species of *A. augusta*. The young green leaves and stems were collected from Joynagar, South 24 Parganas, West Bengal, India, in the month of August-September 2015. A herbarium sheet was prepared and was sent to Botanical Survey of India, Central National Herbarium, Shibpur, Howrah, West Bengal, India for authentication, and the number is "**CNH/53a/2013/Tech.II/123**".

### Chemicals and instruments

All the chemicals used in the experiment were of analytical grade and obtained from Himedia Laboratories Pvt. Ltd. Mumbai, India; Sigma Aldrich; Merck Pvt. Ltd Mumbai, India; Magnesium Carbonate (hydrated) was obtained from Sigma Aldrich Co. Ltd. New Delhi, India [8].

### Mucilage extraction and quantification

The fresh, mature, fungus free green leaves were collected from a full grown plant, washed with Millipore water, and allowed to dry in a hot air oven at a temperature of about 105°C for few hours until it reaches the moisture content of about 5%. The dried leaves were then crushed, powdered and sieved, then allowed to soak in water for 5-6 hours and then boiled for about 30 minutes and the mucilage is extracted [9,10].

**a)** Physical characterization of mucilage: the various physical characterization such as colour, odour, taste, particle shape, solubility in various solvents such as water, chloroform, acetone and ethanol.

**b)** Purity testing of the extracted mucilage: the purity of the mucilage is checked by determining the ash value from the incinerated plant material such as loss on drying, moisture content, alcohol soluble extractives, acid-insoluble extractives, water soluble ash, pH and swelling index were carried out in according to monographs [11,12].

**c)** Phytochemical screening of mucilage: the various phytochemicals such as carbohydrates, tannins, starch, steroids, terpenoids, flavonoids, saponins present in plant's concentrated extract was screened by following standard procedures [13].

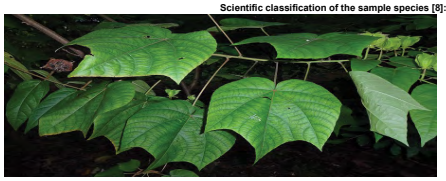
### Suspension property of *Abroma* mucilage

The suspension property is generally measured in terms of pH, particle size, rate of flow, viscosity, sedimentation rate and redispersibility.

### Preparation of mucilage suspension with magnesium carbonate

Previously dried mucilage powder of varied concentrations such as 0.5, 1.0, 1.5 and 2.0 g (grams) and about 5.0 g of magnesium carbonate were triturated in motor pestle with 50 ml of distilled water to form a paste.

**Figure 1:** Leaves and flowers of plant species *Abroma augusta*.



Scientific classification of the sample species [8]:

Kingdom: Plantae
Order: Malvales
Family: Malvaceae
Genus: *Abroma*
Species: *A. augusta*

**Figure 2:** Leaves of *Abroma augusta*.

**Magnesium carbonate ($MgCO_3.xH_2O$):** 500 g of hydrated magnesium carbonate was purchased from the laboratories of Sigma Aldrich, Pvt. Ltd.

### Determination of viscosity

The viscosity of the prepared suspension was measured by Ostwald viscometer, at 10, 20, 30, 40, 50, 60 and 100 rpm at room temperature. The viscosity was calculated by using formulae:

$$\eta^2 = \frac{t^2 \rho_2 \eta_1}{t^1 \rho_1}$$

$\eta_1$=viscosity of water; $\eta_2$=viscosity of suspension; $t^1$=time of flow of water; $t^2$=time of flow of suspension; $\rho_1$=density of water, $\rho_2$=density of suspension

### Determination of sedimentation volume

The sedimentation volume is measured by taking 50 ml of suspension in a 50 ml measuring cylinder, and allowed to stay for 10 days at 35°C, and observed at a regular interval of 24 hours, for five days. The F% (percentage) was calculated by using the formulae:

$$F\% = \frac{Vu}{Vo} \times 100$$

Where, $V_u$=the ultimate volume of the suspension (mucilage+magnesium carbonate) after certain interval, $V_0$=the original volume of the suspension.

### Determination of flow rate

The flow rate is determined by recording the time required for the suspension solution to flow through a 10 ml pipette and the apparent viscosity was calculated by the formulae:

$$\text{Flow rate} = \frac{\text{Volume of solution in pipette (milliliters)}}{\text{Flow time (seconds)}}$$

### Redispersion

The suspension solution is poured into calibrated tubes and kept at room temperature for complete 20 days. At an interval of 5 days, each tube is taken out and shaken vigorously to redistribute the sediments. The presence of deposit if any was recorded.

### pH determination

The pH of the suspension is observed by taking 1% (percent) w/v (weight/volume) suspension solution and diluted with distilled water and shaken for about 5 minutes, and then the pH of the solution is measured by a previously calibrated pH meter [14].

### Particle size determination

The size of the particle dispersed in the suspension solution was measured by using light microscope. A drop of suspension in poured on a glass slide, and spread on it forming a thin film. The stage micrometer is calibrated with an eyepiece micrometer. The particles and their size distribution is then observed.

### Swelling index

The swelling property of the isolated mucilage is observed in order to determine its ability to swell in various mediums such as in distilled water, 0.1N Hydrochloric Acid and Phosphate Buffer. The values are then recorded and given in Table 1.

## Technological Parameters

pH meter from Thermofisher Scientific, Viscometer (Model: 1100) using ORCADA® software, Bz-112 LED Biological Laboratory Microscope BZ Technology Cooperation Limited, Beijing, China Manufacturer.

## Results and Discussion

### Physical characterization

The mucilage obtained was brownish in colour, odourless, sweet in taste, it was freely soluble in hot and cold water, less soluble in boiling water, and sparingly soluble in organic solvents such as chloroform, acetone and ethanol.

### Phytochemical screening

The various phytochemicals present in *A. augusta* plant extract is given in the Table 2. It is found that, are positively present, whereas are absent in the plant extract.

### Physicochemical properties

This involves the determination of loss on drying, moisture content, swelling index, pH, ash value determination with alcohol and water soluble extractives and acid insoluble ash. The values are shown in the Table 3.

### Suspension properties of the mucilage from *A. augusta*

To determine the suspension properties of the plant mucilage various parameters are evaluated such as viscosity, flow rate, sedimentation volume, redispersion ability, particle size and pH. The values of different parameters are given in the Table 4. The viscosity of the mucilage obtained was found to be directly proportional with the concentration of the suspension. It was also found that, with the increase in centrifugation speed of suspension solution, the viscosity of the mucilage gradually decreases. This proves that the suspension prepared from *A. augusta* is having pseudoplastic behaviour.

The plant leave extract is found to be full of phytochemicals such as flavonoids, saponins, mucilage, glycosides, reducing sugar, carbohydrates; whereas proanthocyanidins, proteins and alkaloids are

| Property tested | Distilled water | 0.1N HCl | Phosphate buffer |
|---|---|---|---|
| Swelling Index (in percentage) | 23.5 | 8.3 | 7.6 |

**Table 1:** Swelling Index of the mucilage from *A. augusta* leaves in different pH medium.

| Test | Alcohol extract (leaf) | Aqueous extract (leaf) |
|---|---|---|
| Test for saponins | + | + |
| Test for tannins | - | + |
| Test for carbohydrates | + | + |
| Test for proteins | - | - |
| Test for flavonoids | + | - |
| Test for proanthocyanidins | - | - |
| Test for alkaloids | - | - |
| Test for mucilage | + | + |
| Test for coumarins | + | - |
| Test for glucosides | + | + |
| Test for reducing sugar | + | + |
| Test for steroids and terpenoids | - | - |

"+" (positive) means present; "-" (negative) means absent

**Table 2:** Phytochemicals present and absent in *A.augusta* plant extract.

| Physicochemical properties | Observations |
|---|---|
| Percent Loss on drying | 9 |
| Percent Moisture content | 4.5 |
| Total ash | 6.6 |
| Water soluble extractives | 2.8 |
| Alcohol soluble extractives | 0.9 |
| Water soluble ash | 0.5 |
| Acid-insoluble ash | 0.44 |

**Table 3:** Various physicochemical parameters of the mucilage from *A. augusta.*

| Suspension properties of mucilage | Observations |
|---|---|
| Viscosity | 0.54 Kg/m/s (kilograms/meter/seconds) |
| Sedimentation volume | 0.38 (in percentage) |
| Flow rate | 1.03 ml/sec (millilitre/second) |
| Redispersion property | 0.68 ml (millilitre) |
| Particle size | 0.55 µm (micrometre) |
| pH | 5.65 |

**Table 4:** Various suspension properties of the mucilage from *A. augusta.*

found to be absent. *A. augusta* leaves are found to have more water soluble polar substances as compared to alcohol soluble extractives. It was observed that, the increase in the particle size is directly proportional to the sedimentation rate and inversely proportional to the flow rate of the suspension prepared by the mucilage obtained from *A. augusta* leaves.

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## Conflict of Interest

No conflict was there during the research, neither afterwards.

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